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A WEB SERVICE DISTRIBUTION SYSTEM OVER THE WORLD WIDE WEB ENABLING AUTHORIZED THIRD PARTIES TO TRACK THE DISTRIBUTION OF AND THE BILLING FOR SUCH WEB SERVICES PROVIDED BY SUPPLIERS TO USERS

Technical Field

The present invention relates to distribution of data over the World Wide Web (Web), and particularly to the distribution of a specific types of Web documents known as Web Services items.

Background of Related Art

The past decade has been marked by a technological revolution driven by the convergence of the data processing industry with the consumer electronics industry. The effect has, in turn, driven technologies that have been known and available but relatively quiescent over the years. A major one of these technologies is the Internet or Web. The convergence of the electronic entertainment and consumer industries with data processing exponentially accelerated the demand for wide ranging communication distribution channels, and the Web or Internet, which had quietly existed for over a generation as a loose academic and government data distribution facility, reached "critical mass" and commenced a period of phenomenal expansion. With this expansion, businesses and consumers have direct access to all matter of databases providing documents, media and computer programs through related distribution of Web documents, e.g. Web pages or electronic mail. Because of the ease with which documents are distributable via the Web, it has become a major source of data. Virtually all

databases of public information throughout the world are
accessible and able to be searched via the Web.

The ease with which great volumes of data may be
searched from a computer attached to the Internet and
5   equipped with a Web browser has led to the development of
widespread electronic commerce over the Web. At the
present time, it is becoming very rare to find a business
organization of any kind that does not transact some
aspect of the business via the Web. As consumers and
10   businesses become more familiar and comfortable with Web
transactions, they become more and more willing to try
the Web for other commerce.

Another technology, the development of which has
been accelerated by the Web, is object oriented
15   programming. The computer and communications industries
are extensively participating in the development and
upgrading of Java or like object oriented programming
that may be distributed over the Internet or Web or like
private networks. For details and background with
20   respect to the Java system, reference may be made to a
typical text, Just Java, 2nd Edition, Peter van der
Linden, Sun Microsystems, 1997.

With the development and rapid expansion of the Web
and other like networks, hypertext markup languages
25   became the primary vehicle for distribution of data over
such networks. A basic hypertext language, HTML, is
described in detail in the above-entitled Just Java text,
particularly at Chapter 7, pp. 249-268, dealing with the
handling of Web pages; and also in the text, Mastering
30   the Internet, G. H. Cady et al., published by Sybex Inc.,
Alameda, CA, 1996, particularly at pp. 637-642, on HTML
in the formation of Web pages. The Web pages are
implemented so as to be used for the distribution of Web

documents containing text, images, both still and moving, and sound, as well as programs.

The above three rapidly evolving technologies: the Web distribution network; object oriented programming;

5   and hypertext markup languages have now all been correlated into a system for distribution and exchange via the Web of data between any two computer applications. The system is specifically known as Web Services. The system is based on both suppliers of the

10   data in the form of text based documents and the users of such data conforming to several industry standards developed by the World Wide Web Consortium (W3C). The primary standard is Extensible Markup Language (XML) for defining data and creating markup languages in the form

15   of XML tags. The resulting XML documents are text based and, thus, may be processed on any platform in the distribution of the Web Services. Accordingly, suppliers who wish to offer their Web Services must qualify the proposed services according to the following standards:

20   XML: a hypertext markup language extensively used in the distribution of Web Services and other electronic business components over the Web. (For a basic description of Web Services, reference is made to the text Web Services, A Technical Introduction,

25   H.M. Deitel et al., published 2003, Prentice Hall, Upper Saddle River, for general information and particularly to Appendix A, pp. 319-334.)

          (SOAP) Simple Object Access Protocol: a protocol established to enable the programming

30   objects that form part of the XML items being distributed to communicate with each other via messages (Chapter 6 of the above text).

(UDDI) Universal Description, Discovery, and
Integration Registry: where suppliers or developers
may list their Web Services offered for
distribution, i.e. advertise their Web Services.

5   (WSDL) Web Services Description Language: an
XML language used by suppliers and developers for
describing the offered Web Services on the UDDI
Registry.

           Java Web Services: an object oriented platform
10   for Web Services distribution of modular object
oriented items (described in Appendix C of the
above-mentioned text).

To users and suppliers of Web Services who are
qualified in all of the above required standards, the
15   system has been efficient in the distribution of services
over the Web. The items have been selected by interested
users from the UDDI, distributed over the Web from the
suppliers to such requesting users, and subsequently
billed to and tracked, if necessary, by the requesting
20   user. This has been done with a minimum of human, i.e.
person-machine intervention being necessary; which, of
course, is one the advantages and goals of Web
distribution.

However, as a wider spectrum of users and even
25   suppliers become interested in Web Services, it will have
to be recognized that many in this wider group will not
have the computer sophistication needed to easily conform
their products and needs to the above protocols necessary
to establish Web Services. Still other potential users
30   and suppliers will not be in a position to invest their
own business resources and time in developing the
implementation of the above requisite protocols.

Consequently, in Web Services, as in many other
computer related technologies, the present invention has
recognized the need to have implementations of Web
Services technology that will accommodate the Web
5   sophisticated third parties whom users and suppliers
select to be their Web Services facilitators.

Summary of the Present Invention
The present invention provides a Web communication
network with user access via a plurality of data
10   processor controlled interactive Web display stations
having a Web Service distribution system formed by the
combination of a registry of platform independent Web
Services available as integratable Web Service modules
distributable over the Web from registered suppliers to
15   requesting users, means enabling suppliers to register
said integrated Web Service modules being offered by said
suppliers for distribution to users at said Web station,
means enabling users of said Web Services to request
distribution of such services to their respective Web
20   stations, means enabling said suppliers of said Web
Services to bill the user provided with said Web Services
to bill requesting users for said Web Services provided
over the Web, and means enabling third parties to track
said distribution and said billing via the Web.
25   This enabled third party is preferably an
independent Web services manager or facilitator for
either one of the suppliers or one of the users. This
third party facilitator function could also be performed
by the existing Web or Internet Service Provider (ISP).
30   The basic Web Services system would, of course, conform
to all of the above-mentioned Web Services protocols,
including the UDDI registry for supplier offered

services, the XML document creation standard and SOAP and
Java Web Services object standards.

Brief Description of the Drawings

The present invention will be better understood and
5   its numerous objects and advantages will become more
apparent to those skilled in the art by reference to the
following drawings, in conjunction with the accompanying
specification, in which:

Fig. 1 is a block diagram of a data processing
10   system including a central processing unit and network
connections via a communications adapter that is capable
of implementing the receiving display stations on which
the received user requested Web documents, including Web
Services, may be received. The system may be used for
15   all of the other computers used in the present invention,
including conventional servers used throughout the Web
for Web access servers, source database servers, as well
as the computers supporting the UDDI and the third party
Web Services managers, as well as the service providers
20   in accordance with this invention;

Fig. 2 is a generalized diagrammatic view of a Web
portion upon which the present invention may be
implemented;

Fig. 3 is a general flowchart of a program set up to
25   implement the present invention for a third party to
track the distribution of and billing for Web Services;
and

Fig. 4 is a flowchart of an illustrative run of the
program set up in Fig. 3.

Detailed Description of the Preferred Embodiment

Referring to Fig. 1, a typical data processing terminal is shown that may function as the receiving display terminal on the Web of the user who ordered the
5   Web Services item, as well as the sending terminal of the supplier of the Web Services item. The system may also be used for conventional servers used throughout the Web for Web servers including the servers of the ISP, as well as the servers used by the third parties, e.g. Web
10   facilities providers or outside Web management.

Referring to Fig. 1, a central processing unit (CPU) 10, such as one of the PC microprocessors or workstations, e.g. RISC System/6000™ series available from International Business Machines Corporation (IBM),
15   or Dell PC microprocessors, is provided and interconnected to various other components by system bus 12. An operating system 41 runs on CPU 10, provides control and is used to coordinate the function of the various components of Fig. 1. Operating system 41 may be
20   one of the commercially available operating systems, such as IBM's AIX 6000™ operating system or Microsoft's WindowsXP™ or Windows2000™, as well as UNIX and other IBM AIX operating systems. Application programs 40, controlled by the system, are moved into and out of the
25   main memory Random Access Memory (RAM) 14. These programs include all of the Web Services programs discussed above for the practice of the present invention that will also be described hereinafter for operations wherein the system of Fig. 1 functions as the user or
30   supplier Web terminal for respectively receiving and sending Web Services, as well as the various servers used by service providers and outside or third party Web facilities management in tracking and controlling

distribution in accordance with the present invention. A
Read Only Memory (ROM) 16 is connected to CPU 10 via bus
12 and includes the Basic Input/Output System (BIOS) that
controls the basic computer functions. RAM 14, I/O

5   adapter 18 and communications adapter 34 are also
interconnected to system bus 12. I/O adapter 18 may be a
Small Computer System Interface (SCSI) adapter that
communicates with the disk storage device 20.
Communications adapter 34 interconnects bus 12 with an

10   outside Internet or Web network as appropriate. I/O
devices are also connected to system bus 12 via user
interface adapter 22 and display adapter 36. Keyboard 24
and mouse 26 are all interconnected to bus 12 through
user interface adapter 22. It is through such input

15   devices that the user may interactively relate to the
programs of this invention. Display adapter 36 includes
a frame buffer 39 that is a storage device that holds a
representation of each pixel on the display screen 38.
Images may be stored in frame buffer 39 for display on

20   monitor 38 through various components, such as a digital
to analog converter (not shown) and the like. By using
the aforementioned I/O devices, a user is capable of
inputting information to the system through keyboard 24
or mouse 26 and receiving output information from the

25   system via display 38.
        A generalized example of the practice of the present
invention involving outside third party access to
standard selected supplier to user Web Services XML
modules provided via the Web will be considered with

30   respect to Fig. 2 that shows a generalized portion of the
Web. First, it should be helpful to understand from a
more general perspective the various elements and methods
that may be related to the present invention. Since a

major aspect of the present invention is directed to Web
hypertext documents, such as Web documents and media and
application program content therein, transmitted over
networks, an understanding of the Internet or Web and its
5   operating principles would be helpful. Reference has
also been made to the applicability of the present
invention to a global network, such as the Internet or
Web. For details on Internet nodes, objects and links,
reference is made to the above-mentioned text, <u>Mastering</u>
10   <u>the Internet</u>.

     The Internet or Web is a global network of a
heterogeneous mix of computer technologies and operating
systems. Higher level objects are linked to lower level
objects in the hierarchy through a variety of network
15   server computers. These network servers are the key to
network distribution, such as the distribution of Web
pages and related documentation. In this connection, the
term "documents" is used to describe data packets or
items transmitted over the Web or other networks and is
20   intended to include Web pages with displayable text,
graphics and other images, as well as computer programs.
This displayable information may be still, in motion or
animated, e.g. animated GIF images.

     Web documents are conventionally implemented in HTML
25   language, which is described in detail in the above-
referenced text, <u>Just Java</u>, particularly at Chapter 7,
pp. 249-268, dealing with the handling of Web pages; and
also in the text, <u>Mastering the Internet</u>, particularly at
pp. 637-642, on HTML in the formation of Web pages. In
30   addition, aspects of this description will refer to Web
browsers. A general and comprehensive description of
browsers may be found in the above-mentioned <u>Mastering</u>
<u>the Internet</u> text at pp. 291-313. More detailed browser

descriptions may be found in the text, Internet: The
Complete Reference, Millennium Edition, M. L. Young et
al., Osborne/McGraw-Hill, Berkeley CA, 1999, Chapter 19,
pp. 419-454, on the Netscape Navigator; Chapter 20, pp.
5 455-494, on the Microsoft Internet Explorer; and Chapter
21, pp. 495-512, covering Lynx, Opera and other browsers.
Within this environment, Web Services distribution has
evolved in recent years. Web Services are based on both
suppliers of the data in the form of text based documents
10 and the users of such data conforming to several industry
standards developed by the W3C. The primary standard is
XML for defining data and creating markup languages in
the form of XML tags. The resulting XML documents are
text based and, thus, may be processed on any platform in
15 the distribution of the Web Services. Accordingly,
suppliers who wish to offer their Web Services must
qualify the proposed services according to the following
standards:

XML: a hypertext markup language extensively
20   used in the distribution of Web Services and other
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oriented items (described in Appendix C of the
10   above-mentioned text).

To users and suppliers of Web Services who are
qualified in all of the above required standards, the
system has been efficient in the distribution of services
over the Web. The items have been selected by interested
15   users from the UDDI, distributed over the Web from the
suppliers to such requesting users and subsequently
billed to and tracked if necessary by the requesting
user.

    In light of this background, reference is made to
20   Fig. 2 showing a portion of the Web or Internet set up
for the distribution of Web Services in accordance with
the present invention. The distribution of Web Services
is controlled by server computer 63 that controls and is
supported by UDDI 67 that includes the registry of
25   qualified Web Services suppliers. These registered
suppliers are represented by Web computer stations 64, 65
and 45, each respectively supported by databases 68, 69
and 70. The suppliers may be connected into the Web 50
through any conventional Web access server 62, as in the
30   present example is provided through a Web or ISP.
Similarly, qualified users as represented by Web computer
stations 42, 43 and 56 are connected to Web 50. For
purposes of the present embodiment, let computer station

56 serve as a typical receiving Web display station
through which a user may access Web documents, including
the Web Services XML documents considered in the present
invention.

5   Reference may be made to the above-mentioned
<u>Mastering the Internet</u>, pp. 136-147, for typical
connections between local Web stations to the Web via
network servers; any of which may be used to implement
the system on which this invention is used. The system

10   embodiment of Fig. 2 has a host-dial connection. Such
host-dial connections have been in use for over 30 years
through network access servers 53 that are linked 61 to
the Web 50. The Web server 53 may be maintained by a Web
or ISP to Web computer station 56. Such Web or ISPs are

15   described generally in the above-mentioned text,
<u>Internet: The Complete Reference, Millennium Edition</u> at
pages 14-18. The Web server 53 is accessed by the
receiving station 56 through a normal dial-up telephone
linkage 58 via modem 54, telephone line 55 and modem 52.

20   Any conventional digital or analog linkages, including
wireless connections, are also usable. Web browser
program 59 functions to access the service provider 53.
Receiving computer stations 42 and 43 connected to the
service provider server 53 function similarly to station

25   56.
       Web services may be distributed conventionally with
this arrangement. Suppliers 45, 64 and 65 that satisfy
the above discussed Web Services protocols are registered
in UDDI 67/server registry from which users at stations

30   42, 43 and 56 may select and request, via a Web browser
59, appropriate Web Services from a selected supplier.
These Web Services are then transmitted over the Web 50
in an XML hypertext document format containing objects

embodying the Web Service, e.g. applications program to
the requesting user who is then billed via the Web and in
turn provides for payment via the Web. If there are
billing questions or other tracking questions regarding
5   requested Web Services, the requesting user is dealt with
directly via the Web.

In an example involving the present invention, a
qualified user, e.g. at computer station 56, designates a
surrogate, e.g. Web facilities service 47, to act on
10   behalf of the user at station 56 for all billing and Web
Service item questions. Dashed line 48 is intended to
show this relationship. Thus, Web facilities service 47
may act in all distribution tracking and bill payment
matters. It should also be noted that alternatively the
15   user at Web station 56 may designate his ISP 53 to
perform this third party or surrogate function.
Similarly, a qualified supplier, e.g. at computer station
45, designates a surrogate, e.g. Web facilities service
47, to act on behalf of the supplier at station 45 for
20   all billing and Web Service item questions. Dashed line
49 is intended to show this relationship. Thus, Web
facilities service 47 may act on behalf of supplier
station 45 in all distribution tracking and bill payment
matters. It should also be noted that alternatively the
25   supplier at Web station 45 may designate his ISP 62 to
perform this third party or surrogate function.

Fig. 3 is a flowchart showing the development of a
process according to the present invention for
distributing Web Services in a Web environment. Many of
30   the programming functions in the process of Fig. 3 have
already been described in general with respect to Figs. 1
and 2. In a Web environment, the conventional protocols
described above are set up for the conventional

distribution of Web services, step 61. A UDDI registry
is set up where suppliers of Web Services may list a
description in WSDL of the service being offered, step
62. Provision is made for the distribution of modular

5 objects from the supplier implementing the offered
services that are transmitted in the markup language,
XML, step 63. Suppliers are enabled, step 64, to
distribute their registered Web Service components via
the process of step 63. Users are enabled to request

10 selected registered Web Services from selected registered
suppliers, step 65. Provision is made, step 66, for the
billing for Web Services provided by suppliers in step 64
to requesting users of step 65. Provision is made, step
67, for third parties, e.g. Web facilities managers, to

15 access and track the Web services provided by suppliers
in step 64 to requesting users of step 65, and the
billing of such services in step 66. Provision is also
made, step 68, for authorized third parties, e.g. the Web
facilities managers, to request the Web services of step

20 63 from the suppliers of step 64. There is also provided
a registry function within which users may list
authorized third parties, e.g. Web facilities managers,
step 69.

The running of the process set up in Fig. 3 will now

25 be described with respect to the flowchart of Fig. 4.
First, a supplier receives a request for a Web Service,
step 70. A determination is made as to whether the
requested Web Service has been registered along with the
supplier in the UDDI, step 71. If Yes, a further

30 determination is made as to whether the request is from
an authorized user, step 72. If Yes, then the Web
Service is provided to the requesting user, step 73, the
user is billed and billing and tracking inquiries by user

are enabled, step 74. If the decision from step 72 is
No, a further determination is made as to whether this
request is from a third party authorized to represent a
particular user, step 75. If Yes, then the Web Service
5   is provided to the user, step 76, and the user may be
billed, but billing and tracking inquiries by both the
user and third parties are enabled, step 77. It should
also be noted that billing and tracking inquiries by
authorized users or third parties are handled in a manner
10 similar to requests for Web Services except that
requested information is sent via the Web rather than a
Web Service. Lastly, if the decision from either step 71
or 75 is No, then a message is sent to the requesting
user: "Unable to process request."
15   Although certain preferred embodiments have been
shown and described, it will be understood that many
changes and modifications may be made therein without
departing from the scope and intent of the appended
claims.